ERCB Energy Resources Conservation Board

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Directive 039

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Revised Program to Reduce Benzene Emissions from Glycol Dehydrators

The Energy Resources Conservation Board and Alberta Environment and Sustainable Resource Development have approved this directive on January 18, 2013.

<original signed by>	*<original signed by Matthew Machielse>*
Brad McManus	for Dana Woodworth
Acting Chairman	Deputy Minister
Energy Resources Conservation Board	Alberta Environment and Sustainable Resource Development

Introduction

This edition of Energy Resources Conservation Board (ERCB) *Directive 039* updates the requirements for the reduction management and reporting of benzene emissions from glycol dehydrators (dehydrators). Licensees, however, are still required to meet ERCB *Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting* requirements for cumulative emissions from all sources at the facility or lease site.

With the issuance of this directive, the ERCB and Alberta Environment and Sustainable Resource Development (ESRD) have established requirements to ensure continued reductions of benzene emissions to reduce potential impacts on the public and the environment. New modelling results show that to consistently meet the Alberta Ambient Air Quality Objectives for the benzene one-hour average, the upstream oil and gas industry must reduce current emission targets.

What's New in This Edition

This January 2013 edition of *Directive 039* contains the following key changes:

- Section 1: The Decision Tree Analysis requirement has been changed to a recommendation.
- Section 2: Revised benzene emission reductions have been set out, as well as the implementation schedule with new annual benzene emission limits for some dehydrators coming into effect by January 1, 2014. The new emission limits are based on distance to a permanent residence or public facility.
- Section 4: The due date for submitting the annual Dehydrator Benzene Inventory List has been changed to May 1 from July 1, and the e-mail address for submissions has been updated.

Requirements

1) Licensees must follow the public consultation process outlined in the most recent edition of the Canadian Association of Petroleum Producers (CAPP) document *Best Management Practices for Control of Benzene Emissions from Glycol Dehydrators* (*Benzene Control BMP*).

   When evaluating dehydration requirements in order to achieve the lowest possible benzene emission levels, licensees should use the Decision Tree Analysis in Appendix A of the *Benzene Control BMP* and retain appropriate analysis documentation for review by regulatory agencies.

2) Licensees must ensure that all their dehydrators do not exceed the benzene emission limits for each dehydrator, based on the applicable calendar year, as outlined in Table 1, Table 2, or Table 3.

   Unless Table 2 or Table 3 applies to a dehydrator, benzene emission limits must comply with Table 1. The implementation schedule in Table 2 sets out the updated emission limits at the beginning of the listed calendar year for a dehydrator based on the distance from the emission source to a permanent residence or public facility. Licensees must verify the distance from an emission source to the nearest permanent residence or public facility to ensure that all requisite changes to the dehydrator are made and emission levels assessed.

   The implementation schedule in Table 2 ensures continuous reductions until all existing dehydrators operate within the updated emission limits by January 1, 2018, as set out in Table 3. As of January 1, 2014, all new or relocated dehydrators must not exceed the emission limits specified in Table 3. To qualify for the emission limits for an appropriately designed flare or incinerator, a flare or incinerator must be used that meets the minimum performance requirements in *Directive 060*, Section 7.

   If a dehydrator requires changes to comply with the updated emission limits, the licensee should consider the implications of making multiple changes to comply with the successive reductions set out in Table 2 and are encouraged to upgrade each dehydrator only once to meet the limits in Table 3.

Table 1. Grandfathered glycol dehydrator benzene emission limits

Date dehydrator installed or existing dehydrator relocated	Benzene emission limits
Prior to January 1, 1999	
• Greater than 750 m to permanent resident or public facility	5 tonnes/yr
• Less than 750 m to permanent resident or public facility	3 tonnes/yr
January 1, 1999, to January 1, 2007	3 tonnes/yr
After January 1, 2007	1 tonne/yr

Table 2. Implementation schedule and updated annual benzene emission limits for degrandfathering glycol dehydrators based on distance to a permanent residence or public facility

Implementation schedule by calendar year to reduced emissions		2014	2015	2016	2017	2018
	Distance in metres (m)	Emission limit required as of January 1 of the calendar year in tonnes (t)				
No control or a control other than an appropriately designed flare or incinerator	≤100	0.0				
	101–250	0.1				
	251–750		1.0*	0.5		
	>750			3.0*	2.0*	1.0
After control emission limit for an appropriately designed flare or incinerator**	≤250	1.0				
	251–750			1.0		
	>750					3.0

* Licensees are encouraged to upgrade each dehydrator only once to meet Table 3 limits and to consider the implications of making multiple changes to meet successive reductions as outlined in Table 2.

** An appropriately designed flare or incinerator must meet the performance requirements in *Directive 060*, Section 7.

Table 3. Calendar-year emission limits for all glycol dehydrators effective January 1, 2018

Reduced benzene emission requirements		
	Distance in metres (m)	Emission limit in tonnes (t) in each calendar year
No control or a control other than an appropriately designed flare or incinerator	≤100	0.0
	101–250	0.1
	251–750	0.5
	>750	1.0
After control emission limit for appropriately designed flare or incinerator source	≤750	1.0
	>750	3.0

Specific Benzene Emission Limits

i) If more than one dehydrator is located at a facility or lease site, the cumulative benzene emissions for all dehydrators must not exceed the limit of the dehydrator with the highest emission limit on that site. Modifications may be required to existing unit(s) to meet the site limit.

ii) Any new or relocated dehydrators added to an existing site with dehydrator(s) must operate within maximum benzene emission limit. The cumulative benzene emissions must not exceed the limit of the dehydrator with the highest emission limit on that site.

iii) For dehydrators that are only in operation for a portion of the year, the average daily emission rate must not exceed the above annual benzene emission limits divided by 365. (For example, for a dehydrator with an annual benzene emission limit of 3 tonnes that only operates for six months of the year, the maximum annual emission

limit would be 1.5 tonnes or an average maximum daily emission rate of 8.2 kg/day.) See Section 2.3 of the *Benzene Control BMP* for details on calculating and reporting of emissions from dehydrators that only operate a portion of the year.

3) Licensees must complete a Dehydrator Engineering and Operations Sheet (DEOS) (Attachment 1) to determine the benzene emissions from each dehydrator. This sheet summarizes a dehydrator's average operating conditions and estimates benzene emissions for up to a 12-month period following the DEOS "Revision Date" and must be posted at the dehydrator for use by the operations staff and inspection by the ERCB. The DEOS must be revised every 12 months, upon relocation, or upon a change in status (resume operation, shut-in, bypassed) of the dehydrator.

4) Licensees must complete and submit by **May 1** of each year an annual Dehydrator Benzene Inventory List for the operations of the previous calendar year (Attachment 2), listing all the licensee's dehydrators. This information must be submitted to the ERCB as an Excel file by e-mail to BenzeneD39@ercb.ca.The annual Dehydrator Benzene Inventory List form is available on the ERCB Directive 039 webpage.

The latest version of the *Benzene Control BMP* is available from CAPP at http://www.capp.ca/raw.asp?x=1&dt=PDF&dn=105760. This document describes procedures for selecting appropriate dehydration, calculating emissions, maintaining records, and reporting reductions of benzene emissions from glycol dehydrators. Questions regarding the document and the processes it outlines may be directed to CAPP at 403-267-1100.

Compliance and Enforcement

Requirements are those rules that industry must follow and against which the ERCB may take enforcement action in cases of noncompliance. The requirements set out in this directive will be subject to compliance review by the ERCB. A list of noncompliant events is available on the ERCB website, www.ercb.ca. Enforcement for noncompliance will be in accordance with the latest edition of *Directive 019: Compliance Assurance*.

ESRD may also review for compliance, and failure to comply may result in the issuance of Environmental Protection Orders (EPO), as outlined in the Alberta *Environmental Protection and Enhancement Act*.

Contact Information

Any comments or questions about this directive should be directed to the ERCB's Technical Operations Group at 403-297-6918 or by e-mail at BenzeneD39@ercb.ca or to the ESRD's Policy Branch at 780-427-6869 or by e-mail at randy.dobko@gov.ab.ca.

Background

As described in *IL 2001-07*, the oil and gas industry has had a Benzene Reduction Program in place since 1997. The program is managed by the Benzene Technical Advisory Team, which has included representatives from Health Canada, CAPP, Environment Canada, the ERCB, ESRD, B.C. Environment, and Saskatchewan Environment. A status report showed that only 26 per cent of new dehydrator installations used the Decision Tree Analysis outlined in the November 2000 CAPP *BMP for Control of Benzene Emissions* to optimize dehydrator performance to reduce benzene emissions to as low a level as possible.

Attachment 1 Dehydrator (Dehy) Engineering and Operations Sheet (DEOS) Version Date: June 2006

(This sheet must be revised annually, or upon dehydrator relocation or change in status, and posted at the dehy.)

Technical Contact: Print Name/Phone #/email: _____

Revision Date (dd-mm-yyyy): _____ **Facility or Site Name:** _____

Licensee Name: _____ **Operator Name:** _____

Gov't Licence No: _____ **Location, DLS:** __-__-__-__W_ **(or NTS:** _____ **)**

Installation Type: ☐ Well ☐ Compressor ☐ Battery ☐ Plant ☐ Cavern ☐ Other **DEHY Type:** ☐ TEG ☐ DEG ☐ EG

Date Dehy installed/relocated? (dd-mm-yyyy): _____ **Current Dehy Status:** ☐ Producing ☐ Shut-In ☐ Bypassed ☐ Other: _____ **Date Dehy Status Changed? (dd-mm-yyyy):** _____

Typical number of operating days per year: _____ **Number of dehys on site:** _____

Distance to Closest Resident (if < 750 metres): _____ **Normal Gas Flow Rate to Dehy:** (c^3 m^3/d): _____

Benzene Content in Gas to Dehy (mole %): _____ (If zero, Dehy operations sheet must still be posted)

Feed gas benzene determination method: ☐ Analysis Date of analysis (dd-mm-yyyy): _____

☐ Other (describe): _____

Glycol Pump Make/Model# _____ **Normal Pump Speed:** _____ RPM or SPM

Plunger diameter/stroke length: _____ inches, or _____ mm

Normal Glycol Circulation: _____USgpm **Normal Absorber Temp:** _____°C **Normal Absorber Press:** _____kPag

Emission Calculation Method: ☐ GRI GLYCalc™ Version #:__ ☐ HYSYS™ ☐ ProSim™ ☐ Total Capture ☐ Rich/Lean Glycol ☐ Other—Describe: _____

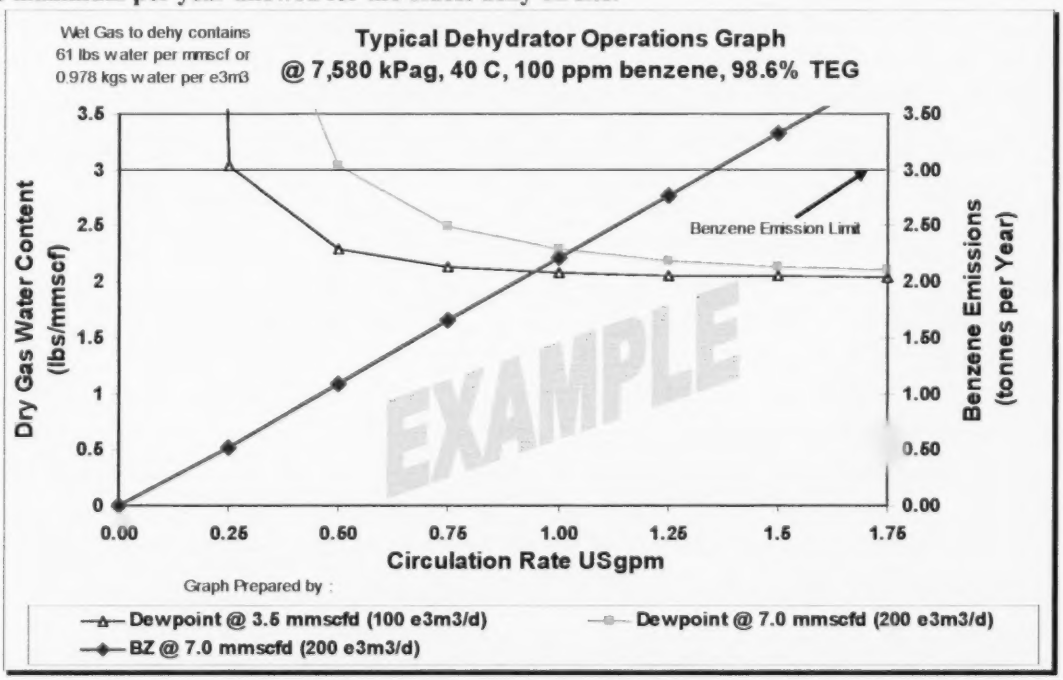
Benzene Emission Controls: ☐ No ☐ Yes Describe (condenser, tank, incinerator, flare, other):

_____

Dehy decision tree analysis (DTA) completed?: ☐ No ☐ Yes **(mandatory for all new or relocated dehys)**

When operating, average benzene emissions (in tonnes/yr)* Before Controls: _____ After Controls: _____

***Note:** In accordance with EUB Directive 039, this dehydrator must be operated below _____ tonnes/yr benzene emissions. If multiple dehys exist on this site, the aggregate benzene emissions must be less than _____ tonnes/yr, which is the maximum per year allowed for the oldest dehy on site.*


Wet Gas to dehy contains
61 lbs water per mmscf or
0.978 kgs water per e3m3
Typical Dehydrator Operations Graph
@ 7,580 kPag, 40 C, 100 ppm benzene, 98.6% TEG
Dry Gas Water Content (lbs/mmscf)
Benzene Emissions (tonnes per Year)
Benzene Emission Limit
EXAMPLE
Circulation Rate USgpm
Graph Prepared by :
Dewpoint @ 3.5 mmscfd (100 e3m3/d)
Dewpoint @ 7.0 mmscfd (200 e3m3/d)
BZ @ 7.0 mmscfd (200 e3m3/d)

Attachment 2 **Canadian Oil and Gas Industry - Annual Dehydrator Benzene Inventory List For:** **2006 (yyyy)** Company Net Gas Production: **$10^3 m^3$ /day**

Instructions: This form must be completed and submitted annually by July 1st for the previous year of operations. Upon completion, submit this form to the Benzene Technical Advisory Team by email to benzene tat@capp.ca Attention: Manager of Alberta Operations, CAPP

Company Data Revision Date: July 1, 2007 Date Submitted to CAPP: July 1, 2007

DEOS Completed	Multiple Dehys on Site?	Licensee	Unique Identifier								Dehydrator Use (Installation Type)			Production Status	Benzene Concentration (Gas to Dehy)	Number of Operating Days per year	Benzene Emissions Rate While Operating	Annual Benzene Emissions for dehydrator	
		Operating Company Name	Field Name	BC Centizone	Complete LSD 01-01-020-25W4	LSD	Sect	Twn	Rge	Mer	Installation Type	Glycol Type	Operating Status	Normal gas flowrate to dehy				Emissions Prior to Control	Emissions After Control
Yes No / Specify: - Shut In - Separator Ops - Sold	Yes / No										Compressor Battery Wellsite Gas Plant Storage Cavern Other	TEG DEG EG Other	Operating Shut-in De-commissioned By-passed Operating as a separator Other	$10^3 m^3$ /day or shut-in or by-passed, or operating as separator or other	Mole % for each dehy	days	kilograms/day	tonnes Number of Operating Days x Emissions Rate	
			Field Name	BC Centizone	Complete LSD	LSD	Sect	Twn	Rge	Mer									
Example Data:																			
Yes	Yes	ABC Resources Inc.	Sample Location Field		01-01-020-25W4	1	1	20	25	4	Compressor	TEG	Operating	200	0.015%	300	2.00	3.50	0.60
Yes	Yes	ABC Resources Inc.	Sample Location Field		01-01-020-25W4	1	1	20	25	4	Compressor	TEG	Operating	200	0.018%	200	9.50	6.00	1.90

Sample

*Note: Copies of the Annual Dehydrator Benzene Inventory List Forms are available from CAPP at www.capp.ca

Annual Dehydrator Benzene Inventory List (continued)

	Cumulative Annual Benzene Emissions		Emissions Calculation Method	Emission Control Method	Installation Details											Comments
Above Dehy Limit?	For all dehydrators on site	Above Site Limit?			Installed / Modified after Jan. 1, 2001?	Date of Installation/ Relocation, if known	Decision Tree Analysis Completed? (EUB Directive 039)	Number of dehys on site	For This Dehy Allowed Annual Benzene Emissions	For This Dehy Allowed Daily Benzene Emissions	Oldest Dehy Allowed Annual Benzene Emissions	Oldest Dehy Allowed Daily Benzene Emissions	Distance to Closest Residence	Were residents contacted?	Date Site Record Changed	Additional Comments
Yes / No	tonnes Add up the emissions from all previous rows per site. Leave single dehys blank.	Yes / No	GRI-GLYCalc™ HYSYS™ Prosim™ Total Capture Rich/Lean Glycol Other (describe)	No Control / Emit to Atmosphere Aboveground/ Underground Tank Flare / Incinerator Process Optimization Commercial Condenser Other (describe)	Yes / No	yyyy-mm-dd	Required for all New/ Relocated Dehydrators		tonnes/yr Show dehydrator limit only	kilograms/day Show dehydrator limit only	tonnes/yr Show dehy limit of oldest dehy on site if more than one dehy	kilograms/day Show dehy limit of oldest dehy on site if more than one dehy	m Flag red if <750 m a	Yes / No c	yyyy-mm-dd	
No			GRI-GLYCalc™	No Control	Yes	2/1/2001	Yes	2	3.0	8.22	5.0	13.70	1,120	No	10/12/2005	New unit
No	2.50	No	GRI-GLYCalc™	No Control	No	2/1/1998	Yes	2	5.0	13.70	5.0	13.70	1,120	No	10/12/2005	Old unit

Sample

*Note: Copies of the Annual Dehydrator Benzene Inventory List Forms are available from CAPP at www.capp.ca